SWEEP

SOIL AND WATER

ENVIRONMENTAL

ENHANCEMENT PROGRAM

RAMRA

FAMPA

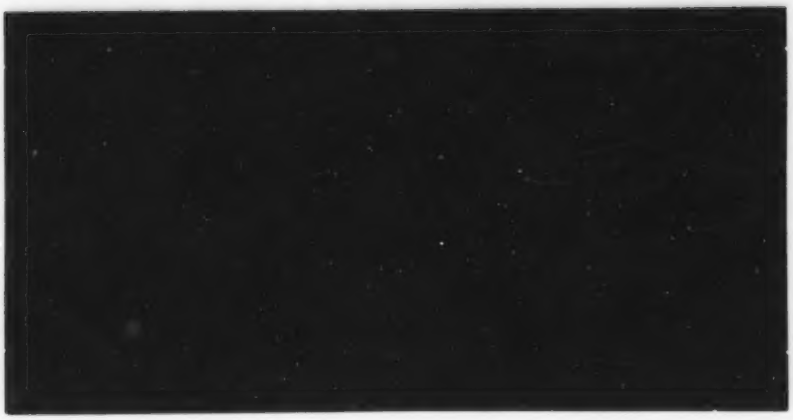
PROGRAMME D'AMÉLIORATION

DU MILIEU PÉDOLOGIQUE

ET AQUATIQUE

Canada

Ontario



SWEEP

is a $30 million federal-provincial agreement, announced May 8, 1986, designed to improve soil and water quality in southwestern Ontario over the next five years.

PURPOSES

There are two interrelated purposes to the program; first, to reduce phosphorus loadings in the Lake Erie basin from cropland run-off; and second, to improve the productivity of southwestern Ontario agriculture by reducing or arresting soil erosion that contributes to water pollution.

BACKGROUND

The Canada-U.S. Great Lakes Water Quality Agreement called for phosphorus reductions in the Lake Erie basin of 2000 tonnes per year. SWEEP is part of the Canadian agreement, calling for reductions of 300 tonnes per year — 200 from croplands and 100 from industrial and municipal sources.

PAMPA

est une entente fédérale-provinciale de 30 millions de dollars, annoncée le 8 mai 1986, et destinée à améliorer la qualité du sol et de l'eau dans le Sud-ouest de l'Ontario.

SES BUTS

Les deux buts de PAMPA sont: en premier lieu de réduire de 200 tonnes par an d'ici 1990 le déversement dans le lac Erie de phosphore provenant des terres agricoles, et de maintenir ou d'accroître la productivité agricole du Sud-ouest de l'Ontario, en réduisant ou en empêchant l'érosion et la dégradation du sol.

SES GRANDES LIGNES

L'entente entre le Canada et les États-Unis sur la qualité de l'eau des Grands Lacs prévoyait de réduire de 2 000 tonnes par an la pollution due au phosphore dans le bassin du lac Erie. PAMPA fait partie de cette entente qui réduira cette pollution de 300 tonnes par an — 200 tonnes provenant des terres agricoles et 100 tonnes provenant de sources industrielles et municipales.

100-05242/

THE 1990-91 ANNUAL EVALUATION OF THE SOIL AND WATER ENVIRONMENTAL ENHANCEMENT PROGRAM (SWEEP)

PREPARED FOR: The SWEEP Management Committee

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EXECUTIVE SUMMARY

The 1990-91 SWEEP program review emphasizes an evaluation of the program's operational goals and objectives. Overall, the program is operating in an acceptable manner. The level of cooperation between the sub-programs and the committees, which in earlier years was a problem, has improved. In general, the program is focused on the objectives and deliverables which will help to achieve the goals of SWEEP.

There is however one area which requires attention. The Conservation Information Bureau (CIB) does not appear to have clear deliverables as addressed in the report. Although, the CIB establishes a set of goals and identifies deliverables, these appear to be ignored in actual operation. This inconsistency should be addressed and an agreement on deliverables reached between Agriculture Canada and the CIB for the remainder of the contract period. The original contribution agreement between CIB and Agriculture Canada does not specify long-term objectives. Annual workplans were also not developed for the CIB. Without goals and objectives, it is difficult to determine if the CIB has achieved the results initially intended.

People involved in the various components of SWEEP are positive and optimistic. The goal of achieving a 200 tonne reduction in phosphorus loadings from the Lake Erie basin appears to be achievable. Early results on a number of small scale tests indicate that the reduction in phosphorus is greater than anticipated. Although the final calculation will not be based solely on a test of this size it is a positive indication of what future results may be.

The Technology Assessment Panel (TAP) objectives have changed over this past year to reflect the completion of the provincial areas of SWEEP. The federal portion of SWEEP will end in 1993. TAP has placed a greater emphasis on the review of work completed or in progress rather than on finding new technologies to be researched.

The Technology Evaluation and Development (TED) component have continued work on the 31 remaining research projects. During the 90-91 fiscal year, TED presented TAP with 7 completed projects for review. It has been generally observed that reports from the University are often more polished in presentation than private sector project reports.

Using the T-2000 data as an indicator, conservation tillage can be used effectively to achieve similar yield results for conservation as for conventional tillage systems. No-till corn yielded only 1 bu/ac or 1.1% less than did the

conventional tilled corn in a series of 35 trials over five years (Appendix 2). In 39 trials during the same five year period, minimum tillage yielded 2.1% less than conventional tillage. Initial data suggests that the economic analysis of these results will indicate that the small drop in yield is more than offset by the drop in production costs.

The information from the Pilot Demonstration Watershed (PDW) component is now emerging. It is expected that these results will show that conservation practices on Ontario farms can be a viable economic alternative to conventional methods. The farmers in the PDW are enthusiastic and have requested an extension of the program because they are now starting to get positive results.

An important priority now is for SWEEP to collect, assemble, categorize and disseminate all the information on conservation practices from SWEEP. This information needs to be made available to the different audiences that can use it, such as farmers, extension and research people. It would be a waste of resources if all this work was completed and left unused on a shelf. There is a sense of urgency for the communication of the results to commence.

RECOMMENDATIONS TO MANAGEMENT COMMITTEE

1) It is recommended: That information in SWEEP reports be transformed into a form that can be readily used by farmers, extension and research people for the overall benefit of conservation farming and the environment. Information from SWEEP, if it is to be utilized, should be organized into a suitable form for the different groups.

2) It is recommended: That future contracts should clarify the communication responsibilities prior to program commencement. This will prevent duplication of effort.

3) It is recommended: That the Management Committee assist the CIB in clearly defining their goals and objectives in relation to their activities within SWEEP. Flexibility can be an advantage, but without specific goals and objectives it is difficult to accomplish the work within their mandate. A system containing time frame elements for establishing goals and reporting on their progress should be developed by the Conservation Information Bureau.

4) It is recommended: That flexibility be increased for the administration of SWEEP. Initially, a number of administration units were established for the program, with a firm directive that a minimum number of meetings be held for each unit. In a number of situations, the "minimum" more than exceeded the "necessary" number and thus the number of meetings to be held should not be identified in administrative directives.

5) It is recommended: That all contracts include an expected completion date for draft reports. Most contracts do not have a predetermined date for the review of the draft report and thus the final report is the first indication of how the product will appear. If changes are necessary, the result is an acceptable report that is received after the end of the contract.

INTRODUCTION

The Soil and Water Environmental Enhancement Program (SWEEP) has completed the fifth year of operation. The program has continued to work toward its overall goal of reducing phosphorus levels in the Great Lakes. This objective is part of the mandate of the Canada-United States Great Lakes Water Quality agreement through the Phosphorus Load Reduction Supplement which requires Canada to reduce phosphorus from agricultural non-point sources in Lake Erie by 200 tonnes per year. SWEEP is a joint federal and provincial program with each contributing $15 million toward its operation.

The Ontario Ministry of Agriculture and Food (OMAF) components were concluded in March of 1990 and the federal components will be completed in March of 1993. Since most of the OMAF commitments were completed before the 1990-91 fiscal year, only the federal segments will be evaluated in this report. The Ontario Ministry of the Environment has an ongoing commitment to SWEEP and is evaluated in this report. A summary of the operations of the provincial sub-program areas will be included in this report.

As in previous reports, the function of the report is to identify problems or deficiencies in the operation of the program. Upon identification, the problems or deficiencies can be corrected before the end of the program and thus the end results improved.

In past reports there has been an emphasis on achievements within SWEEP which will continue with this report. In addition, a greater emphasis has been placed on whether objectives are being reached as outlined in the implementation plans. As was done last year, this report is segmented into sub-program subject areas.

Sub-Program 1
Technology Assessment Panel

The Technology Assessment Panel (TAP) is composed of people from various backgrounds and professions. TAP's initial objectives were evaluation and technical assessment of research projects for the benefit of SWEEP Management Committee.

The Technology Assessment Panel objectives have changed over this past year to reflect the completion of the provincial areas of SWEEP and the federal portion of SWEEP ending in 1993. TAP has placed a greater emphasis on the review of work completed or in progress rather than on finding new technologies to be researched.[1]

TAP members reviewed 4 reports from TED, one from the Socio-Economic Evaluation component and one report from the Farm Level Economic Analysis. TAP meetings were often combined with a visit to conservation type farming operations. During the past year they visited over 20 farms and institutions.

The TAP members represent a cross section of agriculture with many years of experience. The concept of a knowledgable panel of those experienced individuals that evaluate Agriculture ideas and projects has given the SWEEP Management Committee a foundation for decision making. Conservation and the "Green Issues" are currently at the forefront of agriculture policy and TAP is in an ideal situation of having worked in these areas for the last five years and their input may be beneficial. The experience these members have gained during SWEEP could also be utilized to identify projects that would be suitable for future research.

In general, TAP is operating as was originally intended. As SWEEP progresses toward completion, TAP will be reviewing many reports and providing SWEEP Management Committee with comments and recommendations.

Conservation Information Bureau

The Soil and Water Conservation Information Bureau also known as the Conservation Information Bureau (CIB) is part of the University of Guelph with its core funding provided through a four year, one million dollar contribution agreement with SWEEP. SWEEP has a connection to CIB through representatives from Agriculture Canada and OMAF on the CIB advisory committee. The purpose of the CIB is to gather accurate and

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[1] Source: 1990-91 Quarterly Reports to SWEEP Management

objective information on the soil and water resource management, to facilitate the transfer of technical information to farmers and to provide soil and water conservation information to other technical stakeholders[2].

The Conservation Information Bureau has completed its second year of operation. The CIB publishes a newsletter called "Infosource" which was published 6 times last year with an overall objective of promoting conservation.

The bureau has been building a data base on conservation issues. This information can be accessed through a computer with a modem. In the time period January through June 1991 thirty people have accessed the CIB data base. These thirty clients have searched the files an average of 4.5 times since its inception in 1989.[3]

The bureau had to transfer funding from the fiscal year 92-93 in order to meet financial commitments from the 90-91 fiscal year. CIB will receive funding from the Environmental Sustainability Initiative (ESI) to help it through the 1992-93 year.

A CIB Task Force on future funding was established by the CIB advisory committee and directed to include the consideration of non-government fund sources. However, the task force concluded that CIB should look to the Green Plan for funding.[4] As a result, the task-force has decided to disband.[4] The CIB has changed its emphasis so they will fit into the "Green Plan" mold and are using substantial staff time in formulating a Green Plan proposal[5]. It is not clear whether CIB is still committed to any deliverables for SWEEP or whether it has shifted completely to Green Plan objectives. For example the seminar series planned by CIB for the 1991-92 year is based on Green Plan goals[5].

A number of CIB objectives for the past year have not been completed. In the CIB's "Bureau Action Plan", completed in November of 1990 for the 1990-91 fiscal year, a number of items were identified with specific completion dates and are still incomplete or have been cancelled. For example, an "Acreage Tillage Survey" and an "Insects and Diseases in No-

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[2] Source: Soil and Water Conservation Information Bureau Operational Plan

[3] Source: CIB Computer printout

[4] Source: CIB Advisory Panel Minutes

[5] Source: Discussion with Doug Robinson CIB Manager

till" reference sheet were to be completed in December 1990 but were not complete as of June 1991. Reference was also made in the CIB plans for the commissioning of four to six "peer reviews of priority subjects (eg. ground water, manure)" by the end of 1990-91. Objectives were set aside as other issues such as the "Green Plan" were announced during the year and were identified by CIB as being more important. It is not clear who determines or upon what basis new objectives are chosen.

In summary, while CIB establishes a set of goals and identifies deliverables, these appear to be ignored in actual operation. This inconsistency should be addressed and an agreement on deliverables be reached between Agriculture Canada and the CIB for the remainder of its contract period. The original contribution agreement between CIB and Agriculture Canada does not specify long-term objectives. Annual workplans were also not developed for the CIB. Without goals and objectives it is difficult to determine if CIB has achieved the results initially intended. A system containing time frame elements for establishing goals and reporting on their progress should be developed by the Conservation Information Bureau.

Socio-Economic Evaluation

The "Annotated Bibliography of Socio-Economic Soil and Water Conservation Research" and the "1990 Survey of Ontario Tillage and Soil Conservation:Practices, Perceptions and Attitudes" reports were completed and released during the period under review. A contract on "Conservation Tillage Equipment: Availability, Utilization and Needs" was completed. Support for all the reports has been very good and the cooperation with the contractor for the contract in the 1990-91 year was also very good. As a result, the objectives were attained for the period. The "Macro-Economic Assessment of the Soil and Water Environmental Enhancement Program (SWEEP)" draft report has been reviewed by an expert panel and returned to the contractor for revisions.

As new projects may be identified at any time, the committee is prepared to initiate new studies. Additional contract work will depend upon results from other parts of the project. Lead time for contract completion is often limited but given the nature of the work this cannot be avoided.

Sub-Program 2
Technology Evaluation and Development

The Technology Evaluation and Development (TED) component has continued work on the 31 remaining research projects. During the 90-91 fiscal year, TED presented TAP with 7 completed projects for review. It has been generally observed that reports from the University are often more polished in presentation than private sector project reports[6].

A TED & T-2000 workshop was held on March 5-6 1991 in London with 173 people attending the sessions and 119 at the banquet. Farmers represented about 50% of those in attendance[7].

The continuous contact between the contractor, Ecological Services for Planning Ltd and the Scientific Authority has created a good working relationship. Any working problems encountered over the past year by this sub-program were beyond the control of the management. Problems involved instrument failure or machinery parts not being available until after they were required[8].

The GST created some confusion with the contract payments. No previous experience or written explanation on handling the GST paid on government contracts was available. After consulting with Supply and Services this problem has been corrected[8].

The structural organization of the program makes it difficult to incorporate many of the new ideas, coming from the Pilot Demonstration Watershed, to TED for research. This occurs because the TED projects are to be compeleted in March 1992 and the time available is too short to start new experiments.

In general, this sub-program has achieved the desired goals defined in SWEEP. The major task ahead is to make the achievements in TED and the other programs available in a useable form.

Farm Level Economic Analysis

The Farm Level Economic Analysis (FLEA) component of sub-program 2 is the economic arm of SWEEP evaluating each sub-

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[6] Source: Discussion with the TED Scientific Authority Dr. Wally Findley

[7] Source: 1990-91 Quarterly Report to SWEEP Management

[8] Source: Discussion with TED Scientific Authority Dr. Wally Findley

program's economic impact on the farm firm, on the watershed farmers collectively, on the local municipality, and on the watershed authority.

Due to the dependency on all the other sub-program operators, the FLEA contractors "Deloitte and Touche" are affected significantly by delays or omissions in data, as was the case for the initial set of watershed data. These problems have been corrected and they are back on schedule for the 1990 crop year data[9].

Communication within the sub-program is good. Pilot Demonstration Watershed communication with other sub-programs has improved by having the economic contractor participate in the Pilot Demonstration Watershed (PDW) monthly meetings.

A change in the Scientific Authority for the project has caused some communication lapses but this can easily be corrected through a more formal reporting arrangement (possibly by having monthly meetings), with the Scientific Authority as recommended by the economic contractor[10].

Sub-program 3
Pilot Demonstration Watershed

The Pilot Demonstration Watershed uses three watersheds in southern Ontario each having a test and control site. These watersheds are Essex, Pittock, and Kettle creek. The Essex and Kettle Creek watershed cooperators show interest in the project to the extent that they would like to see an extension of the program because they are just now seeing the results of the conservation farming practices on economic yield as well as erosion control.

Originally there were communication problems among some contractors causing a delay in data retrieval. However a change in personnel and improved communication through meetings, memos and telephone conversations have improved the relationship among the contractors and is resulting in fewer problems and higher quality work.[11]

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[9] Source: Deloitte & Touche

[10] Source: 1990-91 Quarterly Report to SWEEP Management Committee

[11] Source: Discussion with Scientific Authority Dr. Greg Wall

The test area in each watershed is showing increased residue cover (foliage or crop residue covering the soil), which will result in less sediment reaching the waterways. For example, the Essex watershed had 52.6% of the land in the test area and only 28.6% in the control area with greater than 40% residue cover during the winter of 1990-91 (Table 1)[10].

Table 1 Watershed Residue Coverage (> 40%)

Watershed	Control	Test
Essex	28.6	52.6
Kettle Creek	30.1	34.3
Pittock	56.8	65.6

Source: PDW Scientific Authority, Dr. Greg Wall

The objective of the Rainfall Simulation Test was to demonstrate that residue and therefore conservation tillage practices reduce phosphorus pollution by looking at the difference in sediment and phosphorus loadings on conventional and conservation systems. Rainfall Simulation Tests show the amount of Total Runoff, Total Suspended Solids (TSS) and the Total Phosphorus (TP) from a one meter square test area of soil (Appendix 1). Spring 1991 data from the Kettle Creek watershed shows significant differences between the conventional and conservation tillage systems. The Kettle Creek watershed control had 14.57 mg/l of total phosphorus while the test site had 1.09 mg/l of total phosphorus in the runoff water. The positive results appear to reflect a high level of surface residue (Appendix 1).

In general, the Land Resource Research Centre's part of the PDW component appears to be functioning well with few problems. The attitude of the watershed farm co-operators has shifted from tentative to enthusiastic about soil and water conservation. The farmers in the control sites are now using conservation tillage practices on some land that is outside the control areas.

The water quantity monitoring by the Water Resources Branch of Environment Canada has been hampered by poor water channels. Vegetative growth has required more attention and maintenance by the technical staff. The monitoring component will be affected in this coming year due to budget allocation reductions. The water quantity component achieved all the desired results in 1990-91 with the 1990 data yet to be analyzed and reported in the regular publications[12].

[12] Source: Discussion with Scientific Authority Mr. Len Kamp

The Ontario Ministry of the Environment (MOE) has been monitoring the water quality in the Pilot Demonstration Watershed (PDW) areas using Beak Consultants as their main contractors. Any problems were operational in nature and were corrected[13].

During the 1990-91 season there were 10-12 rainfall events sampled at each watershed pair, in addition to regular interval samples.

The communication between MOE and the other participants was excellent. This can be attributed to having the same contractor as Agriculture Canada.

Overall the PDW program is working the way it was expected to work. There are many different scales (ie. 1 m^2, field scale, watershed scale) used in the PDW program, and they are showing consistent results. As a result, the level of confidence in results at the end of the program should be high.

Sub-Program 4
Local Demonstrations

The Tillage 2000 program was extended an additional year to get a fifth crop year data into the tillage analysis. This year there were 19 tillage comparisons within the SWEEP watershed area. In Ontario there were a total of 32 tillage comparison sites, including the watershed sites[14].

The final results of the five years of the T-2000 are currently being evaluated. Using the T-2000 data as an indicator, it appears as though conservation tillage can be used effectively to achieve similar yield results for no-till and moldboard tillage systems. No-till corn yielded only 1 bu/ac or 1.1% less than did the conventional tilled corn over a series of 35 trials over five years. In 39 trials during the same five year period, minimum tillage yielded 2.1% less than conventional tillage (Appendix 2)[15]. It is expected that the economic analysis of these results will indicate that the small drop in yield is more than offset by the drop in

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[13] Source: Discussion with Scientific Authority Mr. Jim Eddie

[14] Source: Discussion with Scientific Authority Mr. Howard Lang

[15] Source: Tillage 2000 Information and Data was received from Mr. Howard Lang.

production costs.

The T-2000 results for wheat were also very encouraging, but the small number of projects reduces the confidence in the preliminary findings which are in favour of minimum tillage.

The 1990 Soybean yield results improved the 4 year average (no data for 1987 were collected) for conventional compared to no-till to be equal over 18 trials. The minimum tillage also improved to a five year average loss of 0.7 bu/ac or 2%. This was very encouraging because conservation tillage may also be profitably used for soybeans (Appendix 2).

Sub-Program 5
Technical Assistance

The Technical Assistance sub-program was completed previous to the 1990-91 evaluation period, and therefore was not assessed in this review. The 1989-90 review carries the last annual review on the Technical Assistance component of SWEEP.

The Technical Assistance sub-program was directly assisting farmers using a group of conservation advisors located in county OMAF offices. The team of eleven officers with expertise in soil and crops, soils and water, engineering and farm management provided their services to help diagnose soil problems on individual farms.

These soil advisors held numerous educational meetings in the SWEEP area. The activities included educational meetings, conservation tillage clubs, courses, conservation farming updates, No-till workshops, conservation tillage days and competitions. There were also numerous written materials produced such as factsheets, newsletters, newspaper articles, conservation bulletins and brochures[16].

Using a different set of resources, farmers in the SWEEP area continue to receive technical assistance from OMAF through normal extension services.

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[16] Source: 1990-91 SWEEP Annual Report

Sub-Program 6
Soil Conservation Incentives

The Soil Conservation Incentives sub-program was completed prior to the 1990-91 fiscal year and therefore was not assessed in this years review. The 1989-90 review carries the last annual review on the Soil Conservation Incentives sub-program of SWEEP.

The Ontario Soil Conservation and Environmental Protection Assistance Program's (OSCEPAP) purpose was to assist farmers with the capital cost on projects that support environmental protection and soil conservation. Projects supported under the environmental protection component included manure storage structures, milkhouse waste disposal systems and pesticide handling facilities. Soil conservation projects assisted include grassed waterways, drop inlet structures, catch basins, and tile outlet protection[17].

This sub-program provided approximately $8.3 million in grants. There were 346 environment protection projects which accounted for 47% of the budget and 583 soil conservation projects which accounted for 53% of the budget[18].

Following the completion of OSCEPAP, Land Stewardshep I & II continued to assist farmers in funding conservation and environmentally beneficial projects.

Sub-program 7
Administration

The SWEEP administration tracks the program progress from a budgeting perspective and is the linkage between the different sub-programs. Administration is also responsible for implementation plans, annual reports and the compilation of other reports. The budget and accounting system is keeping accurate records so that sub-programs do not overspend.

The administration has had some difficulty in receiving feedback on the first draft of the implementation plans which has delayed the report. This delay had no effect on the program or operation. The 1989-90 annual report was also delayed due to administration changes but should be released

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[17] Source: 1990-91 SWEEP Annual Report

[18] Source: 1989-90 SWEEP Annual Progress Report

shortly[19].

Considering the magnitude of the program administration appears to be well organized and has good control of SWEEP.

Public Information

The purpose of the Public Information component of SWEEP is to disseminate information provided by the other sub-programs to the public.

Some participants have indicated that several of the sub-programs have their own communication programs. This may have resulted in some duplication. However, considering the stage of SWEEP it is appropriate that the individualized communication strategies remain in place. Future projects might clarify communication components prior to commencement of the project.

The issue of most concern now facing the communication component is the development of a plan for getting the information contained within the reports into a format useable by farmers, extension and the research communities. It is important that all of the sub-programs work together to format the information for these identified groups[20].

The public information component has met the objectives that were expected of it. As the program results come to the TED, PDW and the T-2000 it is important that these sub-programs direct information to the communication committee for dissemination. The sub-programs must ensure the communication component has the information that is useful for the public for overall SWEEP success.

Monitoring and Evaluation

The objectives of the monitoring and evaluation component were met in the 1990-91 year.

Sub-program managers were very cooperative in providing all the necessary information for the successful completion of the evaluation and the 1989-90 Annual Review[21].

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[19] Source: Discussion with SWEEP Program Officer Mr. Mike Hicknell

[20] Source: Discussion with Ms. Lisa Hardey

[21] Source: Discussion with Mr. Martin Bohl

The Provincial Government had started the final evaluation for their components of SWEEP.

Conclusion

The 1990-91 SWEEP program evaluation has emphasized the evaluation of the program's operational goals and objectives. In general the program is operating in an acceptable manner with only minor problems which can be corrected. The level of cooperation between the sub-programs and the committees, which in earlier years was a problem, has improved.

The program in general, is focused on the objectives and deliverables which will help to achieve the goals of SWEEP. With guidance from the SWEEP Management Committee the CIB can also establish a clear set of deliverables for the remainder of the program.

The attitude of the people involved in SWEEP is positive and optimistic. The goal of achieving a 200 tonne reduction in phosphorus loadings into the lake Erie basin appears to be achievable. On a small scale testing basis the reduction in phosphorus runoff is greater than anticipated. Although the final calculation will not be based solely on a test of this size it is a promising indication of future results.

The information from the Pilot Demonstration Watershed component and the Tillage 2000 component is now emerging. It is expected that these results will show that conservation practices on Ontario farms can be a viable economic alternative to conventional methods. Farmers in the PDW are enthusiastic and have requested an extension of the program because they are now starting to get positive results. This optimism will be instrumental in the transfer of conservation technology to other producers.

An important priority now is for SWEEP is to collect, assemble, categorize and disseminate all the information on conservation practices from SWEEP. This information needs to be made available to the different audiences that can use it, such as farmers, extension and research people. It would be a waste of resources if all this work was completed for it to be left on a shelf. There is a sense of urgency for the communication of the results to commence.

APPENDIX 1

WATERSHED SEDIMENT AND PHOSPHORUS LOADINGS

Rainfall Simulation Test

The objective of the Rainfall Simulation Test was to demonstrate that surface residue and therefore conservation tillage practices reduce phosphorus pollution. Three 1 m^2 areas in the watershed were used and subjected to a simulated thunderstorm. An analysis on the total suspended solids and total phosphorus content was completed on the runoff water.

The appendix contains a graphical representation of the rainfall simulation results. Each watershed has two graphs. The first graph for each watershed shows the total suspended solids contained in the runoff water. The second graph for each watershed displays the total amount of phosphorus contained in the runoff water. Each bar has a label identifying the watershed name, whether it is a test or a control and the sample number. (For example, "ec1". The "e" stands for the watershed name, Essex, the "c" stands for control (or test) and the "1" stands for the sample number.)

Each watershed area chosen had a different crop history. They are as follows:

Essex Control - Conventional Winter Wheat
Essex Test - Winter Wheat disced twice

Kettle Creek Control - Conventional Corn
Kettle Creek Test - No-till Corn

Pittock Control - Moldboard Alfalfa
Pittock Test - Alfalfa chiselled twice

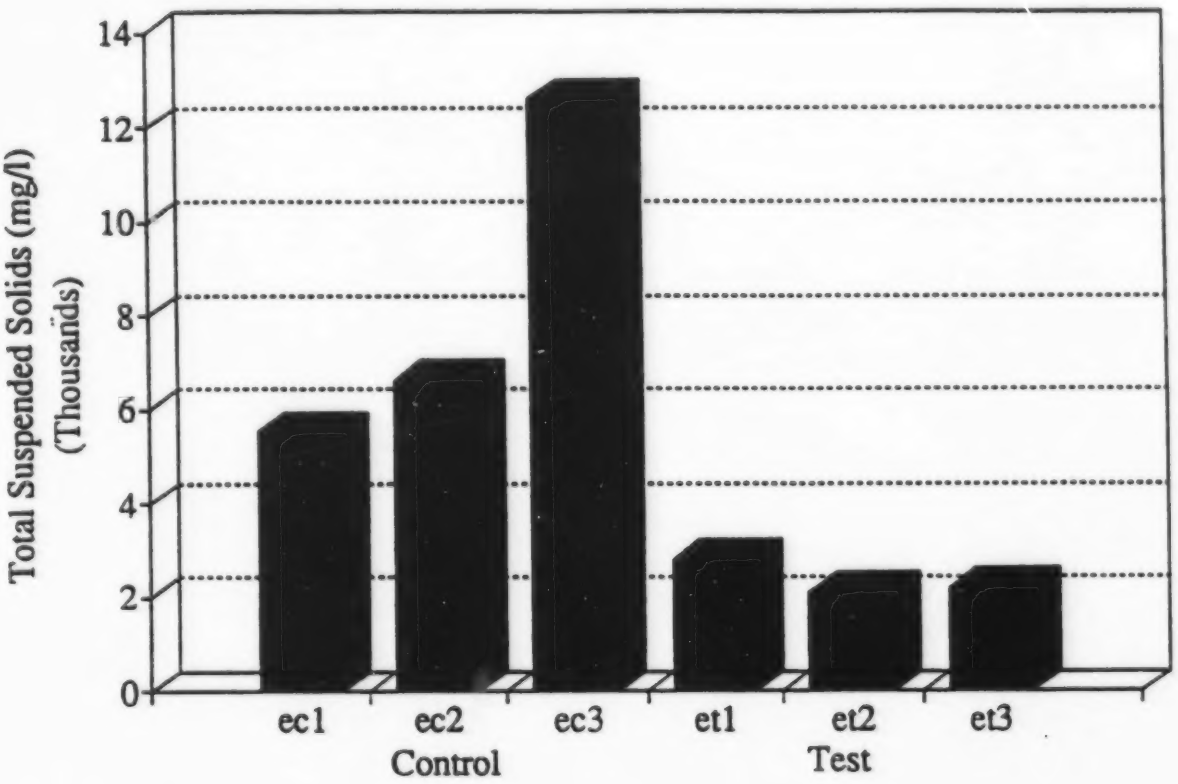
Table 2 Rainfall simulator results from Spring 1991

	RUNOFF(ml)	TSS(mg/l)	TP(mg/l)	Residue
Essex Control	13116.7	8233.3	11.17 a	5%
Essex Test	5183.3	2366.7	4.5 a	64%
Kettle Control	450.0	11166.7	14.57 a	3%
Kettle Test	22983.3	1064.7	1.09 b	80%
Pittock Control	2450.0	6600.0	7.53 a	3%
Pittock Test	3950.0	4733.3	10.27 a	10%

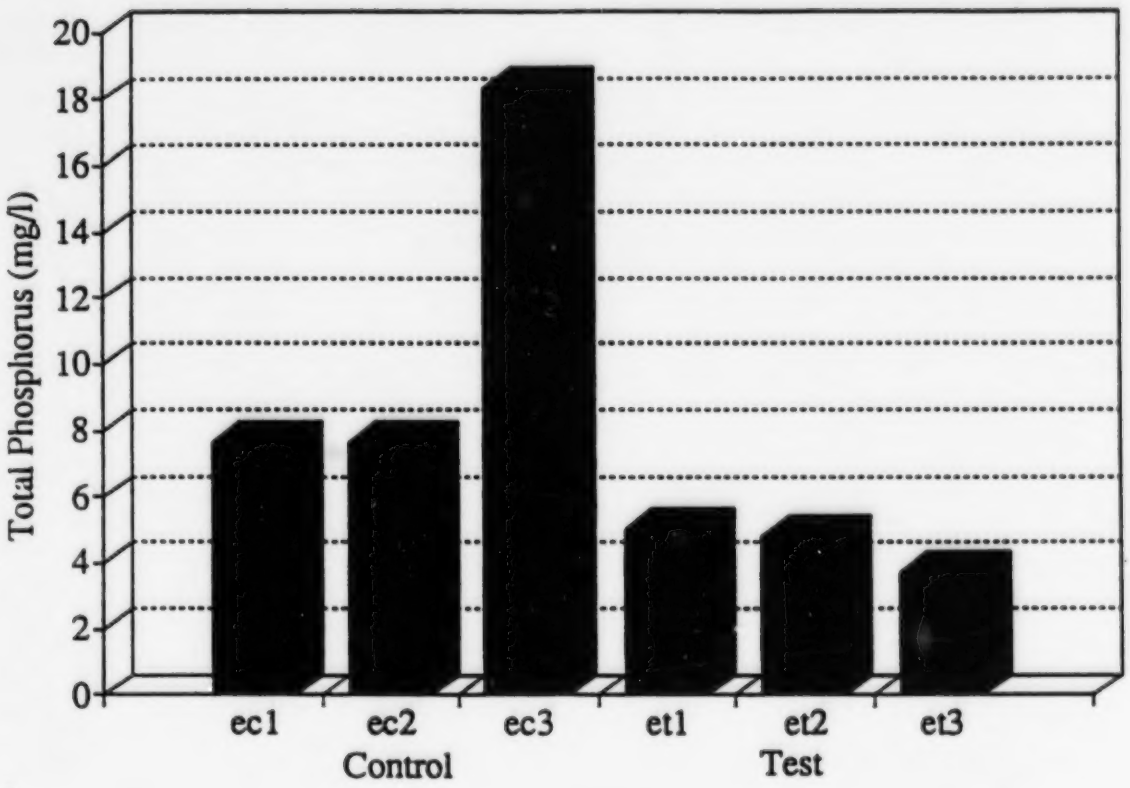
Test and contrcl values with different letter codes (a,b) indicate a significant difference at alpha = 0.05

Source: 1990-91 PDW Annual Report by Consultants Beak and CMS

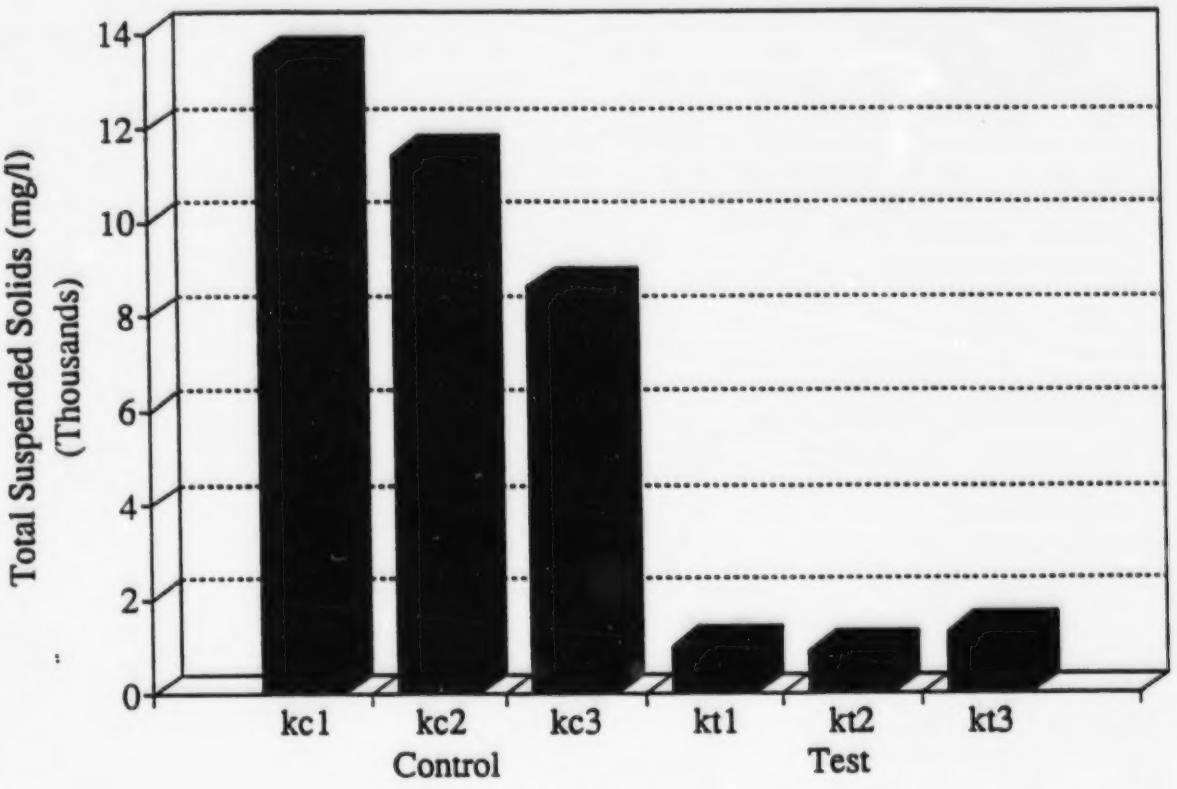
Rainfall Simulation Results-Spring 1991
Essex Watershed-Total Suspended Solids



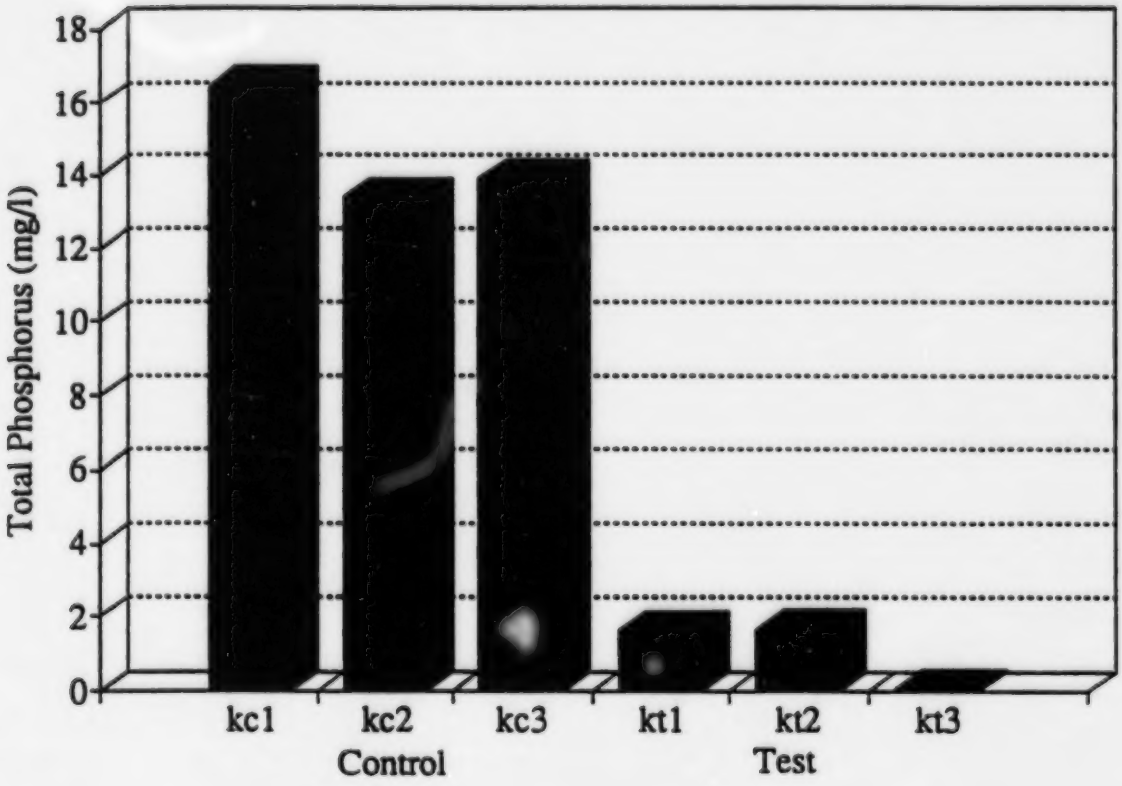
Rainfall Simulation Results-Spring 1991
Essex Watershed - Total Phosphorus



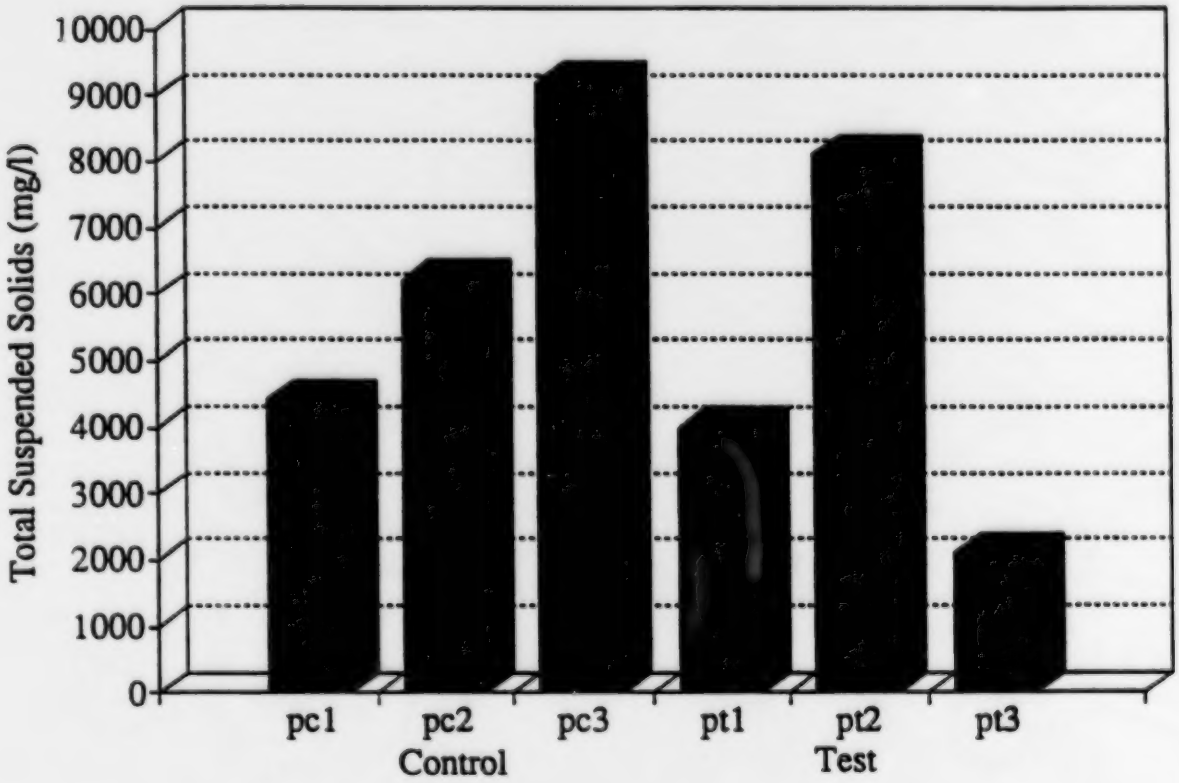
Rainfall Simulation Results-Spring 1991
Kettle Watershed - Total Susp. Solids



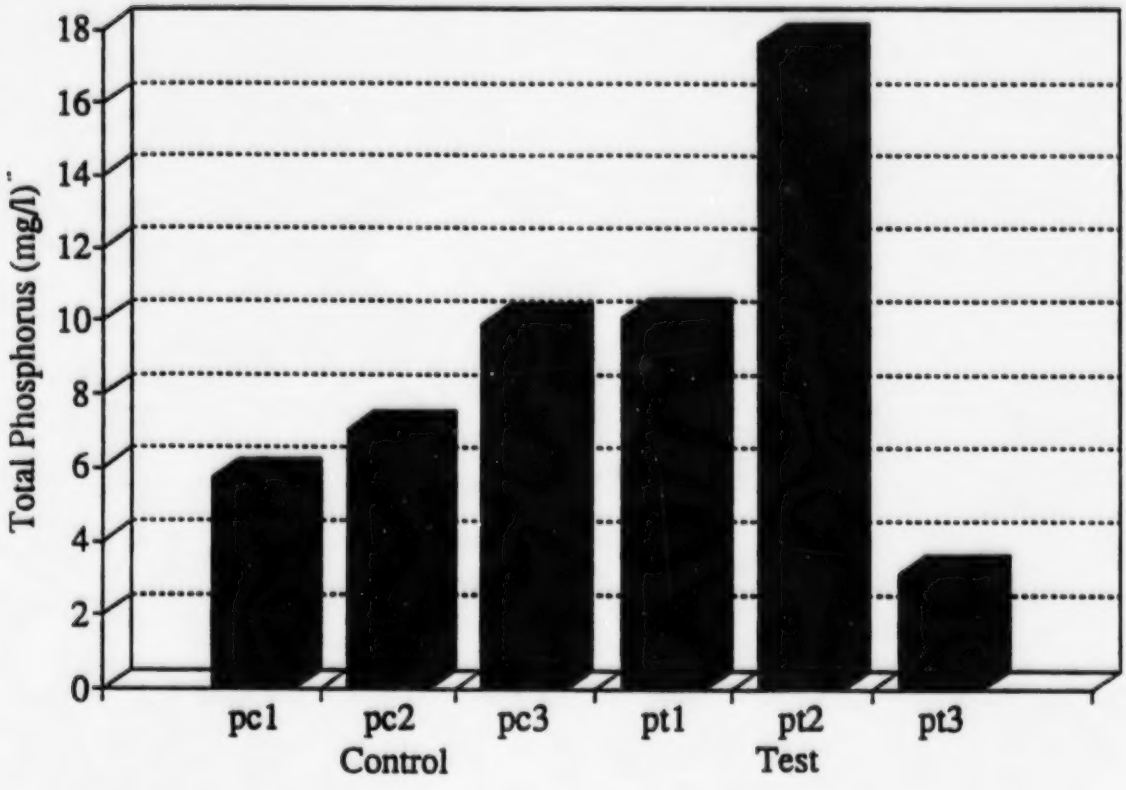
Rainfall Simulation Results-Spring 1991
Kettle Watershed - Total Phosphorus



Rainfall Simulation Results-Spring 1991
Pittock Watershed - Total Susp. Solids



Rainfall Simulation Results-Spring 1991
Pittock Watershed - Total Phosphorus



APPENDIX 2

TILLAGE 2000 RESULTS

The Tillage 2000 is an OMAF run Demonstration project. The purpose of the program was to show farmers, using their land, that conservation tillage systems can be viable. It was initially intended to run five years but continued on for another 6 months to get an extra year of data. The number of trials vary from year to year based upon the farmers choice of crops to grow and the tillage method to be tested.

Using the T-2000 data as an indicator, it appears as though conservation tillage can be used effectively to achieve similar yield results for conservation and conventional tillage systems. No-till corn yielded only 1 bu/ac or 1.1% less than did the conventional tilled corn in a series of 35 trials over five years. In 39 trials during the same five year period, minimum tillage yielded 2.1% less than conventional tillage.

The Appendix contains yield data for corn and then soybeans along with a graphical representation of the yields. All the information on the Tillage 2000 was received from the Scientific Authority Mr. Howard Lang.

TILLAGE 2000 CORN TRIAL RESULTS

CORN MOLDBOARD/NO-TILL COMPARISONS

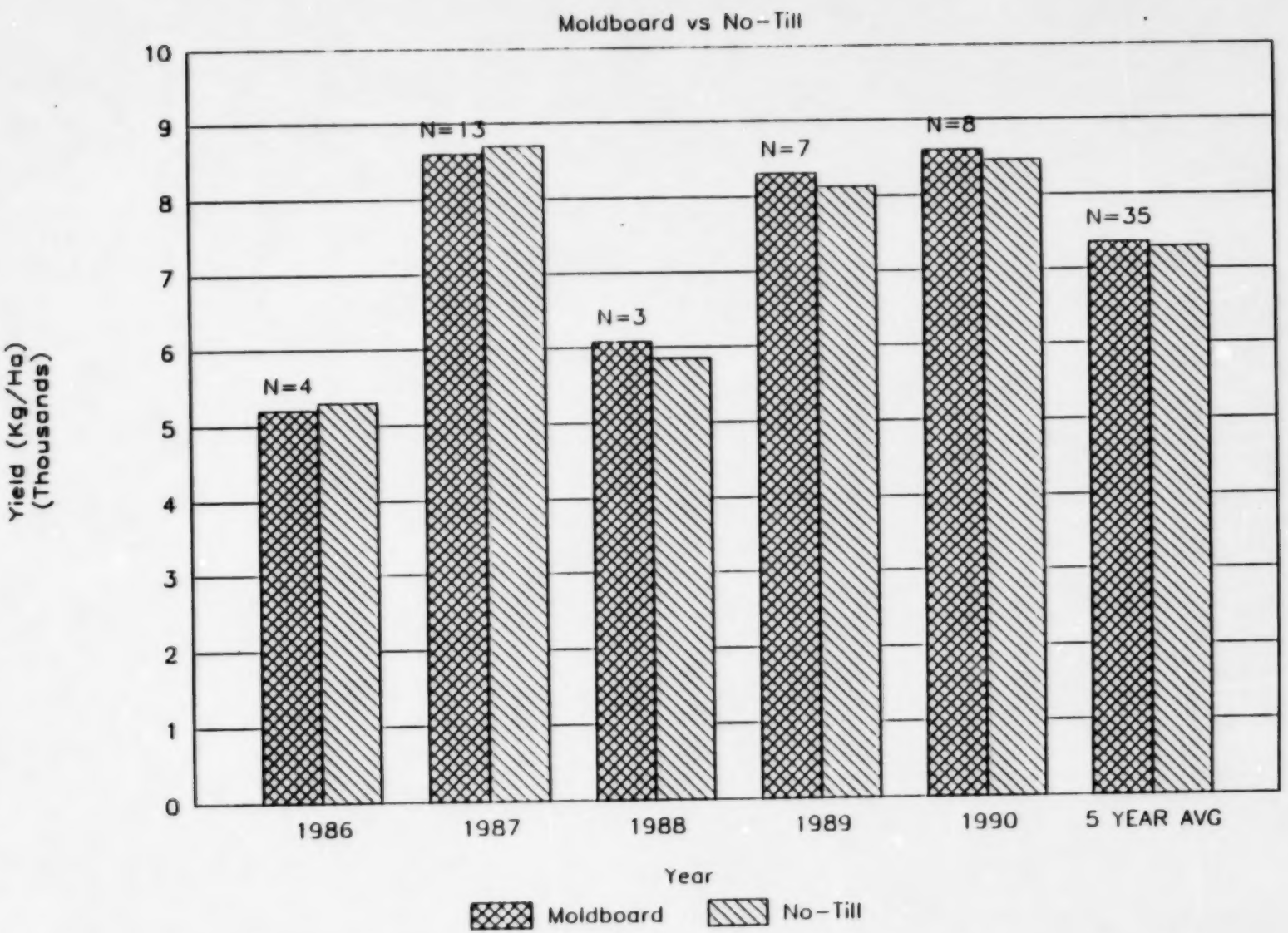
YEAR	MB-Kg/Ha	NT-Kg/Ha	DIFF	INDEX	TRIALS
1986	5203.4	5297.6	94.2	101.81%	4
1987	8599.2	8705.9	106.7	101.24%	13
1988	6075.9	5849.9	-226.0	96.28%	3
1989	8304.2	8128.4	-175.7	97.88%	7
1990	8599.2	8467.4	-131.8	98.47%	8
5 YEAR AVG	7356.4	7289.8	-66.5	99.14%	7

CORN MINIMUM/NO-TILL COMPARISONS

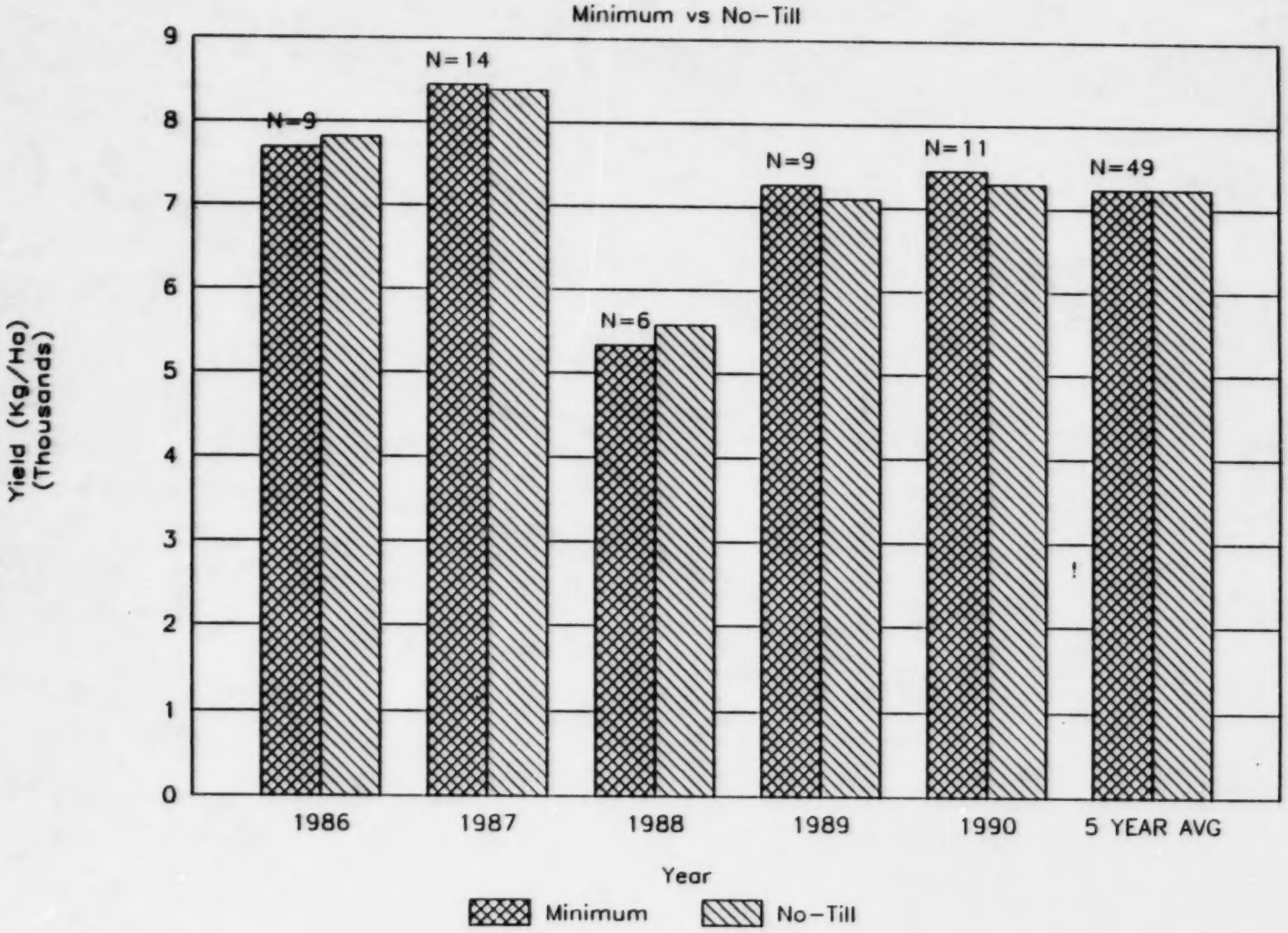
YEAR	MIN-Kg/Ha	NT-Kg/Ha	DIFF	INDEX	TRIALS
1986	7689.0	7814.6	125.5	101.63%	9
1987	8442.2	8379.5	-62.8	99.26%	14
1988	5322.7	5567.5	244.8	104.60%	6
1989	7262.2	7105.3	-156.9	97.84%	9
1990	7444.2	7293.6	-150.6	97.98%	11
5 YEAR AVG	7232.1	7232.1	0.0	100.26%	9.8

CORN MOLDBOARD/MINIMUM COMPARISONS

YEAR	MB-Kg/Ha	MIN-Kg/Ha	DIFF	INDEX	TRIALS
1986	6986.0	6703.6	-282.5	95.96%	8
1987	8618.0	8404.6	-213.4	97.52%	14
1988	7381.5	7576.1	194.6	102.64%	3
1989	7726.7	6992.3	-734.4	90.50%	6
1990	7124.1	7318.7	194.6	102.73%	8
5 YEAR AVG	7567.3	7399.0	-168.2	97.87%	7.8

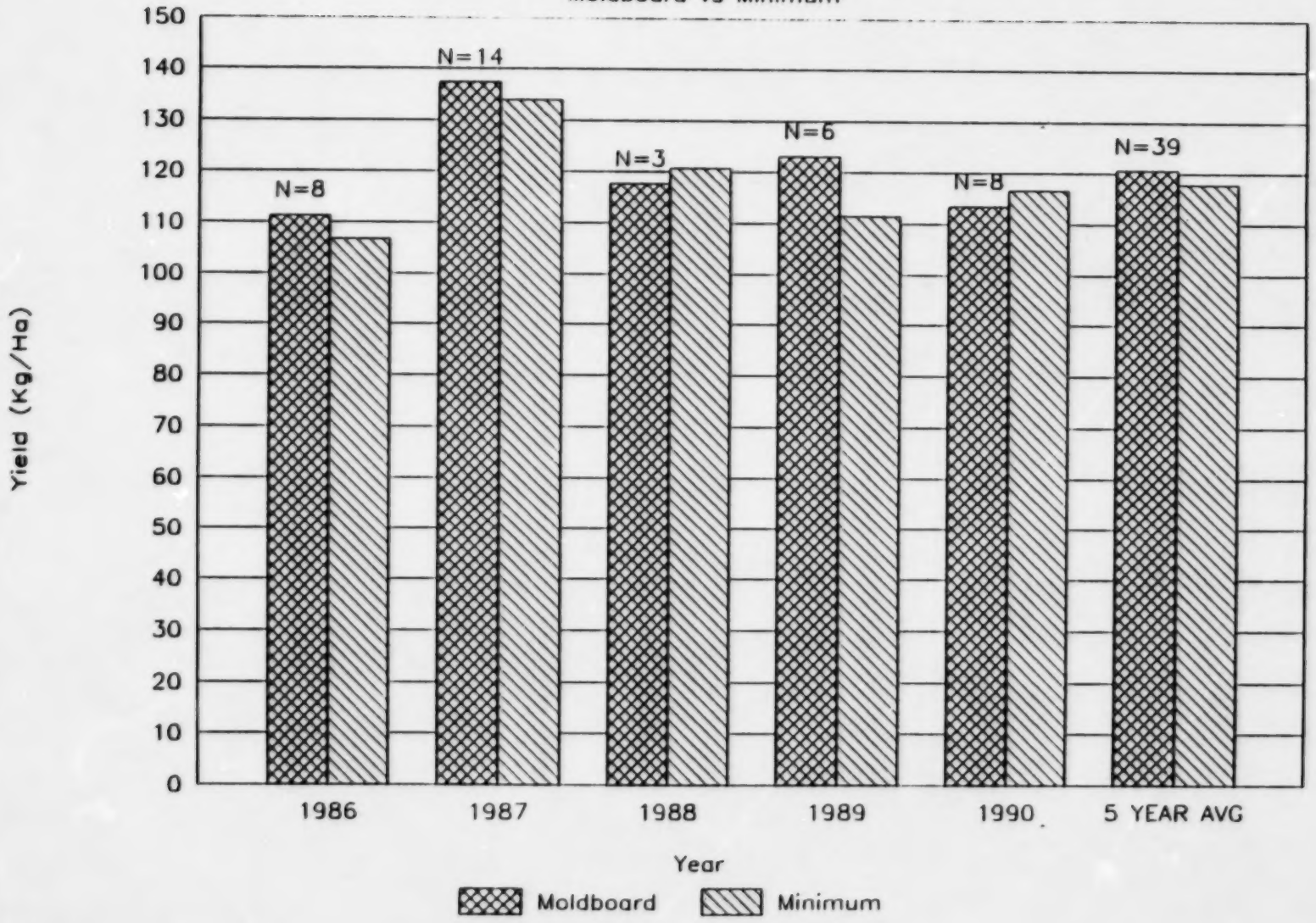

CORN
Moldboard vs No-Till
Yield (Kg/Ha)
(Thousands)
10
9
8
7
6
5
4
3
2
1
0
N=4
N=13
N=3
N=7
N=8
N=35
1986
1987
1988
1989
1990
5 YEAR AVG
Year
Moldboard
No-Till

CORN


Minimum vs No-Till
Yield (Kg/Ha) (Thousands)
0
1
2
3
4
5
6
7
8
9
N=9
N=14
N=6
N=9
N=11
N=49
1986
1987
1988
1989
1990
5 YEAR AVG
Year
Minimum
No-Till

CORN

Moldboard vs Minimum



TILLAGE 2000 SOYBEAN TRIAL RESULTS

SOYBEANS MOLDBOARD/NO-TILL COMPARISONS

YEAR	MB-Kg/Ha	NT-Kg/Ha	DIFF	INDEX	TRIALS
1986	2609.3	2421.0	-188.3	92.78%	2
1987	0.0	0.0			
1988	2394.1	2407.6	13.5	100.56%	8
1989	2158.8	2031.0	-127.8	94.08%	4
1990	2609.3	2925.4	316.1	112.11%	4
5 YEAR AVG	1954.3	1957.0	3.4	99.88%	4.5

SOYBEANS MINIMUM/NO-TILL COMPARISONS

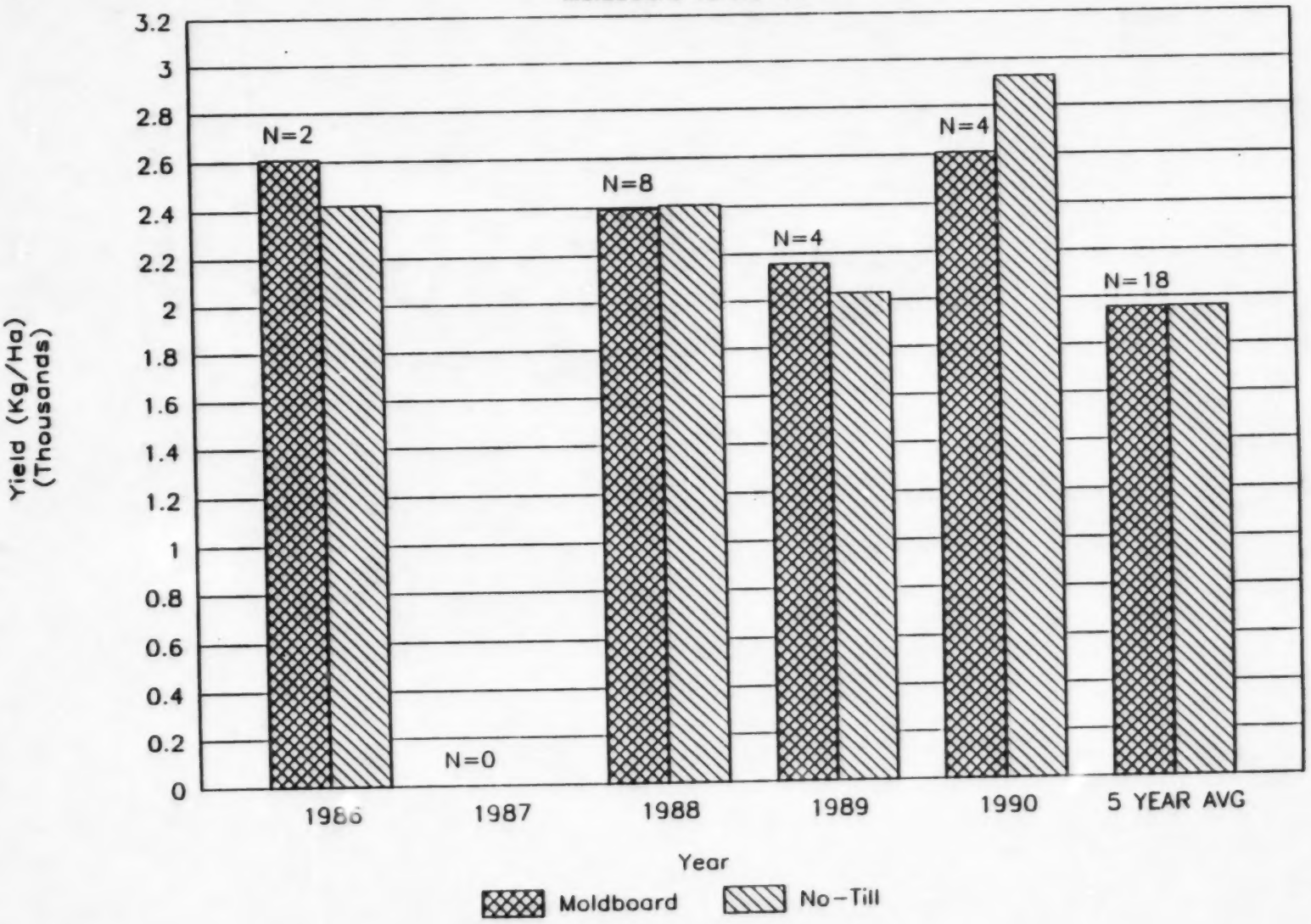
YEAR	MIN-Kg/Ha	NT-Kg/Ha	DIFF	INDEX	TRIALS
1986	2434.5	2414.3	-20.2	99.17%	5
1987	2622.8	2488.3	-134.5	94.87%	3
1988	2367.2	2326.9	-40.4	98.30%	7
1989	2037.7	1815.8	-221.9	89.11%	5
1990	2461.4	2656.4	195.0	107.92%	2
5 YEAR AVG	2384.7	2340.3	-44.4	97.87%	4.4

SOYBEANS MOLDBOARD/MINIMUM COMPARISONS

YEAR	MIN-Kg/Ha	NT-Kg/Ha	DIFF	INDEX	TRIALS
1986	2609.3	2421.0	-188.3	92.78%	2
1987	3557.6	3490.3	-67.3	98.11%	2
1988	2481.6	2306.7	-174.9	92.95%	10
1989	2353.8	2051.2	-302.6	87.14%	4
1990	0.0	0.0			
5 YEAR AVG	2200.5	2053.8	-183.3	92.75%	4.5

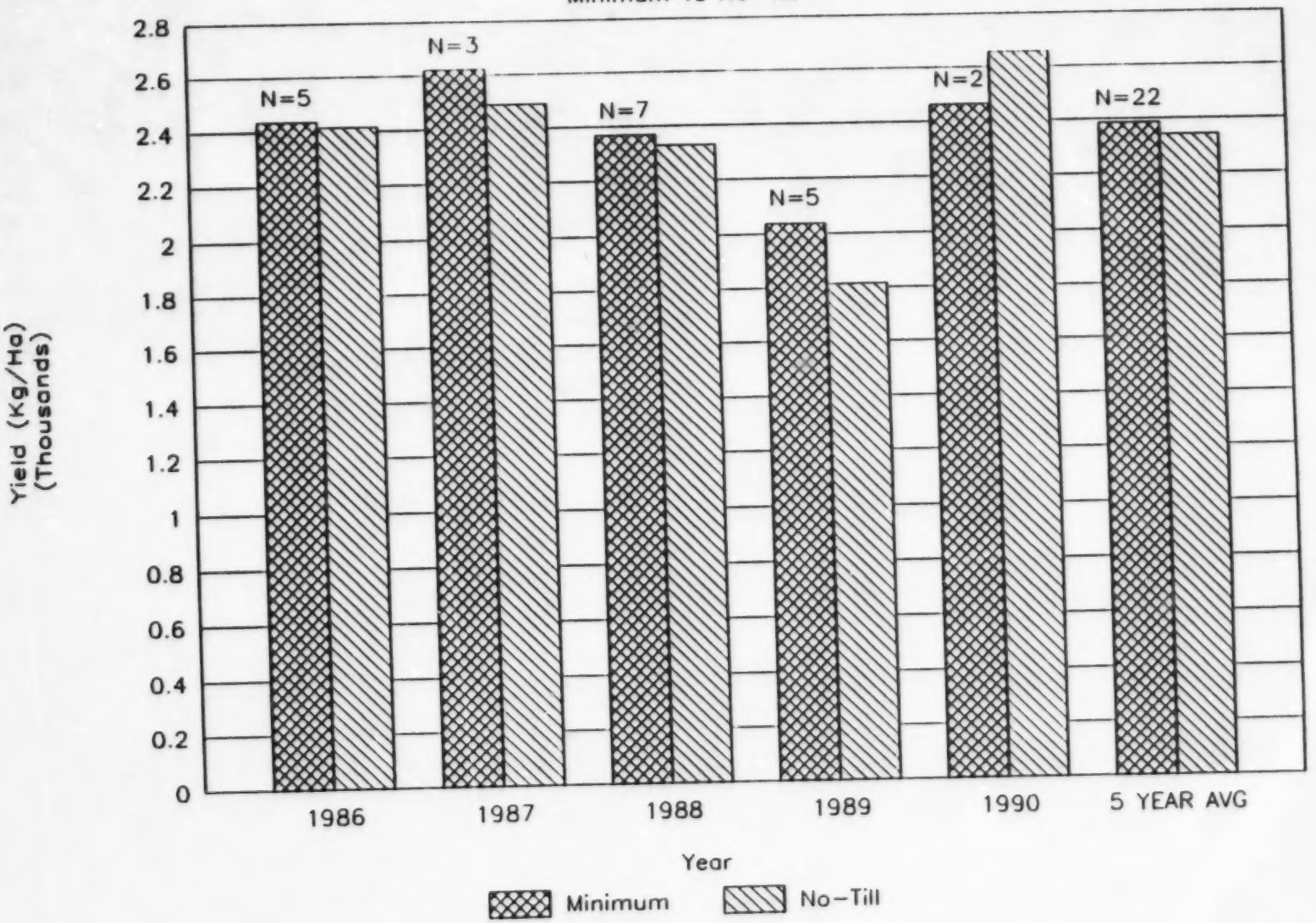
SOYBEANS

Moldboard vs No-Till

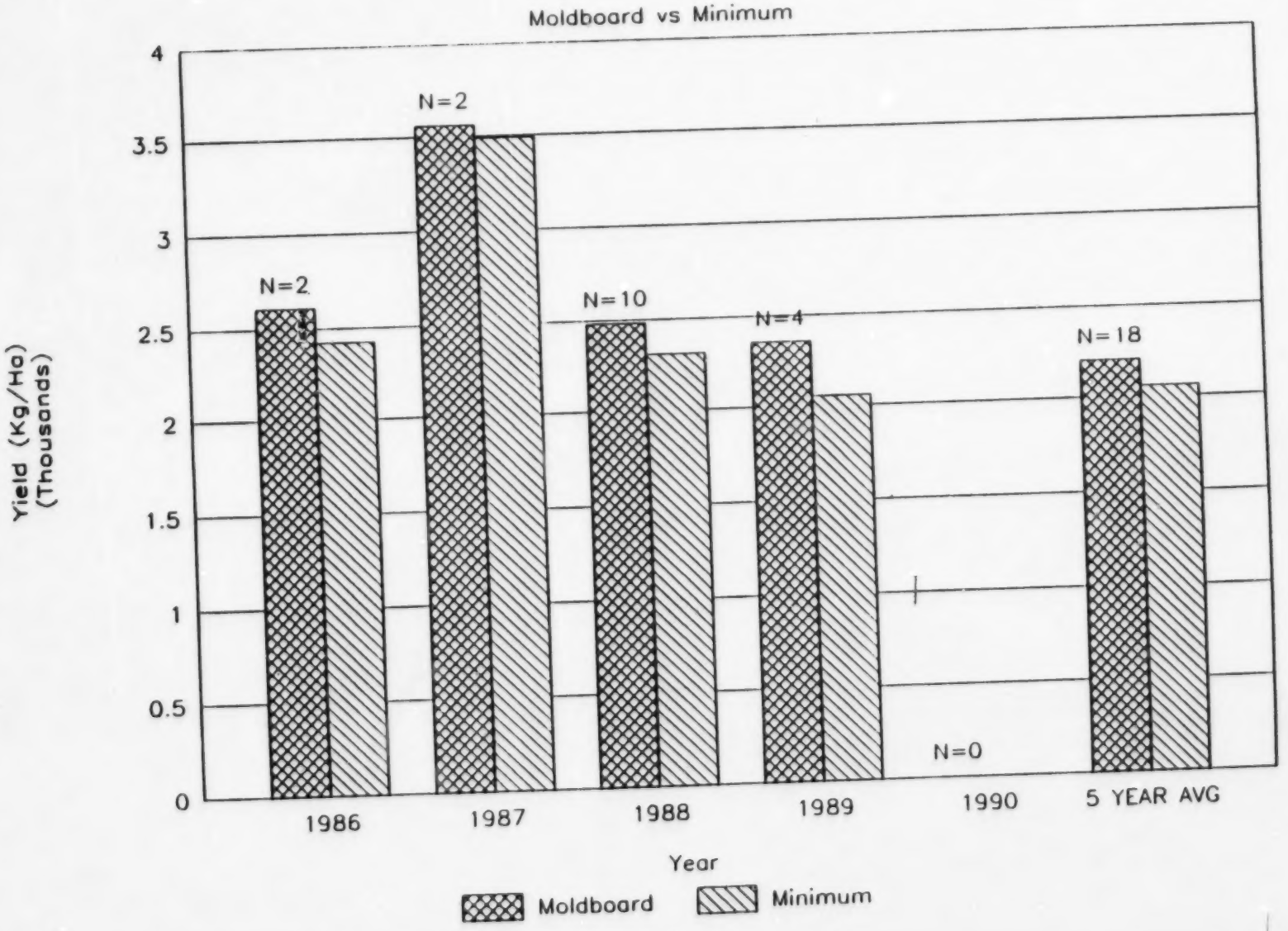


SOYBEANS

Minimum vs No-Till



SOYBEANS


Moldboard vs Minimum
Yield (Kg/Ha)
(Thousands)
4
3.5
3
2.5
2
1.5
1
0.5
0
N=2
N=2
N=10
N=4
N=0
N=18
1986
1987
1988
1989
1990
5 YEAR AVG
Year
Moldboard
Minimum